

Updates from Commissioning and Science Verification (CSV)

Eric Villard (ALMA JAO)

Extracts from presentation

by Alison Peck

Quick introduction

- Two sites, in the North of Chile:
 - Operations Support Facility (OSF), at 3000m
 - Array Operations Site (AOS), at 5000m
- The OSF is where the antennas are assembled/integrated/verified, where the control room is and where the personnel lives.
- The AOS is the observation site where the antennas and electronics are, including the correlator.

The OSF



The AOS



Quick overview of antenna workflow

1. The antennas arrive to the OSF in pieces (more or less depending on constructor).
2. The structure is assembled at the manufacturer's camp.
3. The antenna is brought to the pads near the technical building, where the AIV team prepares it for operations (e.g. front end integration, panel setting, pointing/focus model determination).
4. The antenna is transported to the high site, where the CSV team uses it.

First European antenna delivered to AIV (April 21)



The AIV team is very busy (May 3)



Group structure of CSV team

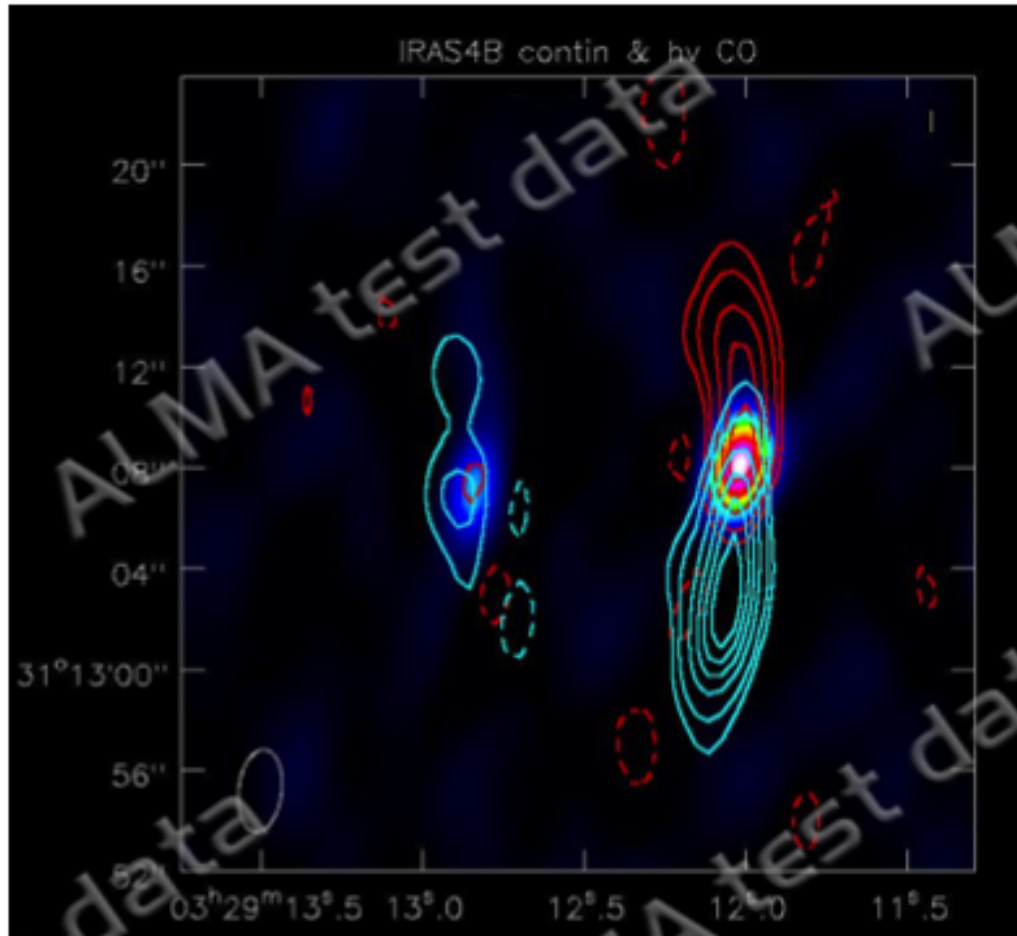
- Antenna: final test and characterization at high site, monitoring
- Calibration: phase, amplitude, bandpass, polarization
- Correlator: hardware & software 64-input and ACA up to Archive
- Documentation: quality & organization of reports, procedures, records
- Imaging: data reduction, configuration planning, ancillary (weather, etc)
- Observing Modes: end-to-end test, Observing Tool, science verification
- System: covers signal path from input to front-end to arrival at correlator

Quick overview of activities during the last couple months

- New ALMA software (R8) deployed in December. Focused on testing and debugging until February.
- Campaign of polarization observations in February.
- Many nights lost to bad weather in February and March.
- Focusing now on science verification
- 10 antennas currently at high site

Pre-science verification observations

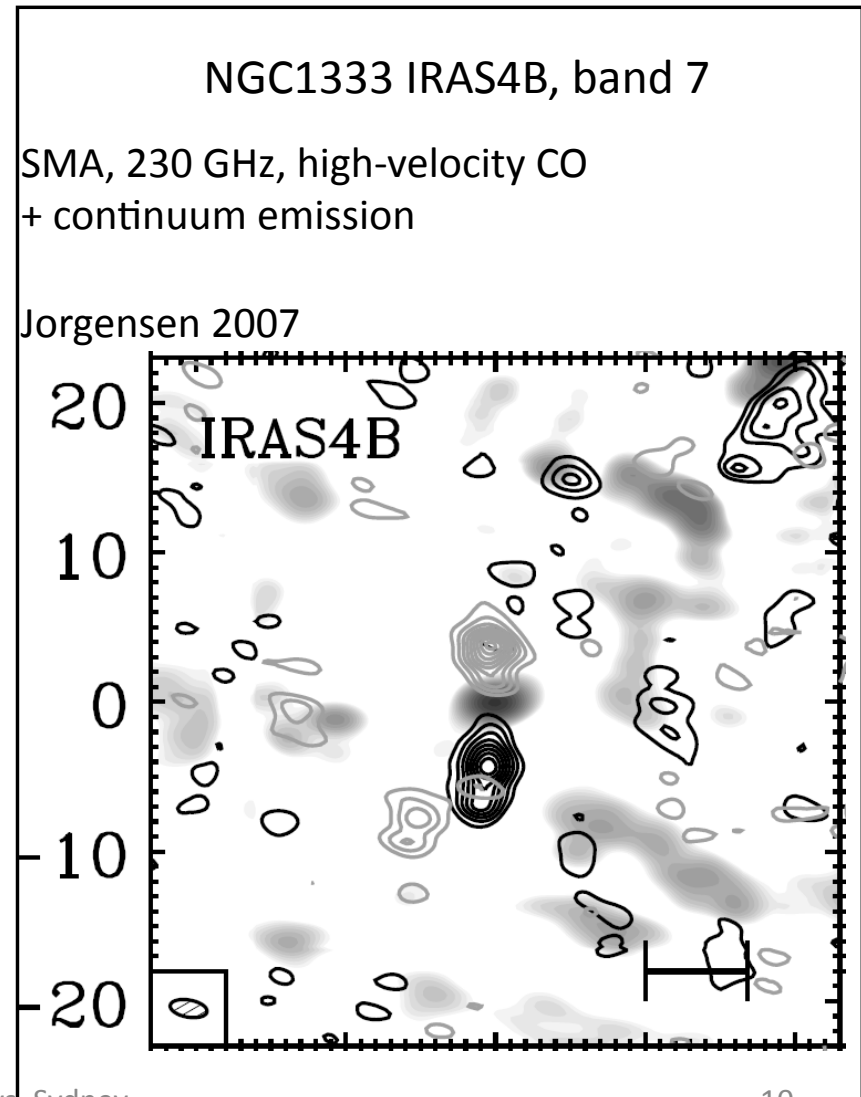
Galactic, high-velocity outflows



Observed on September 16
7 antennas, band 7, high-velocity CO + SO +
continuum emission

May 5-6 2011

Credit: JAO science team



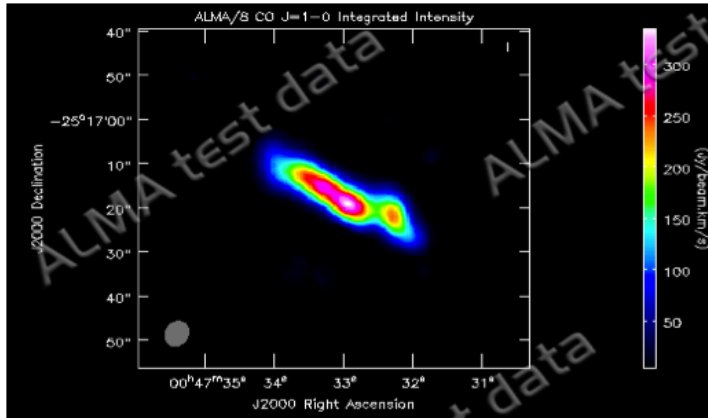
ALMA community days, Sydney

10

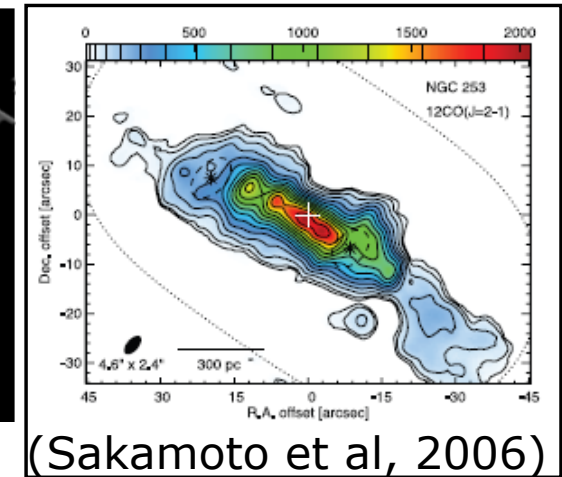
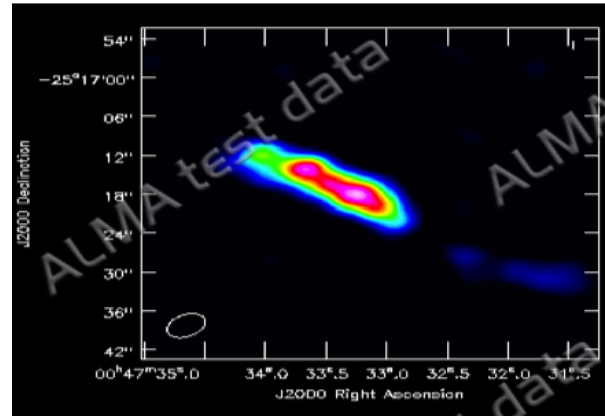
Pre-science verification observations

Extragalactic, broad line/strong continuum

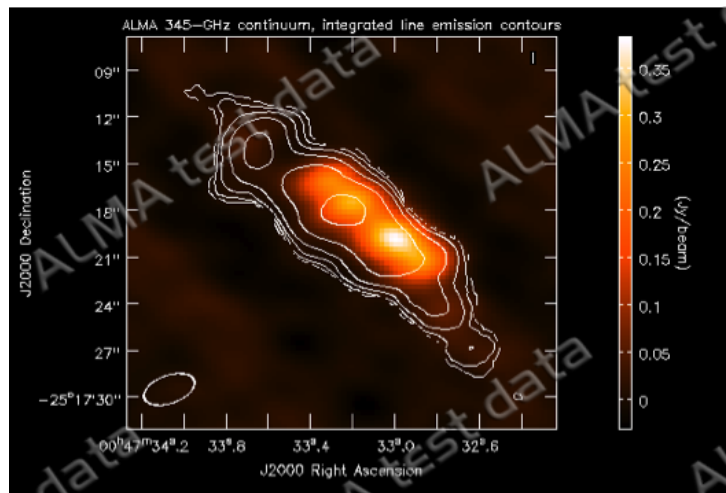
NGC 253 – B3 – CO J=1-0



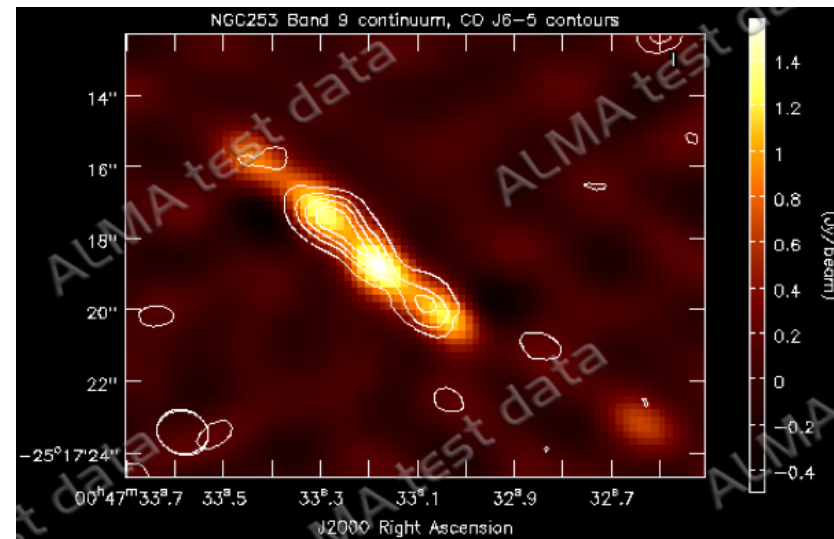
NGC 253 – B6 – CO J=2-1



NGC 253 – B7 – CO=3-2

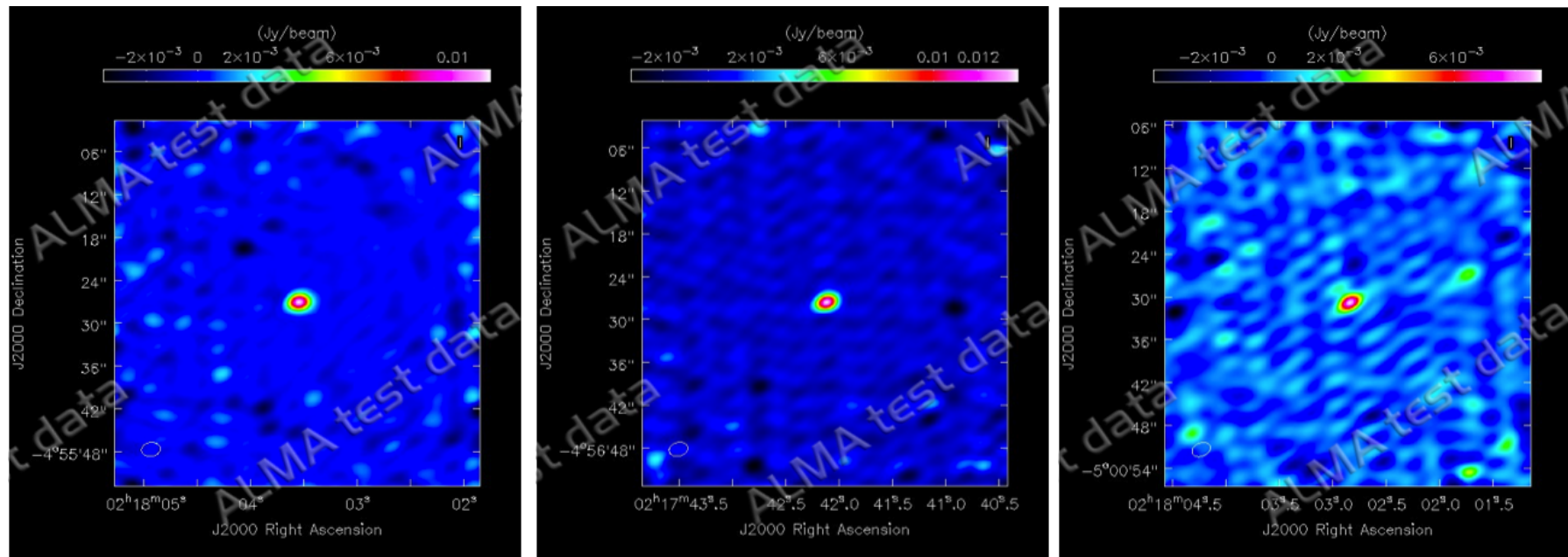


NGC 253 – B9 – CO=6-5



Pre-science verification observation Extragalactic, Faint Continuum (High z)

SHADES SDXF 850.1, 3 and 5 at 345 GHz

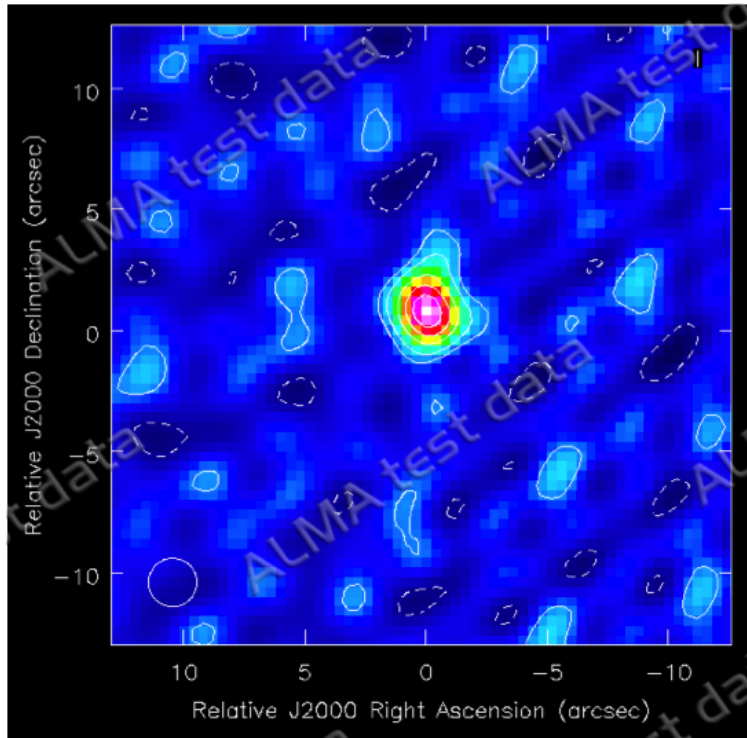


Also testing multiple science targets in SB with
single phase calibrator -- Oct 10, 2010

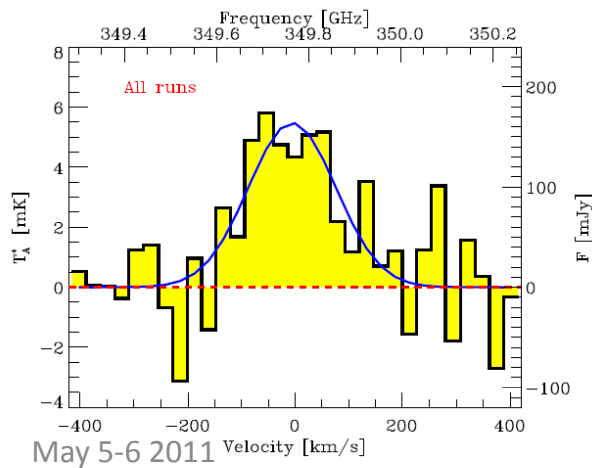
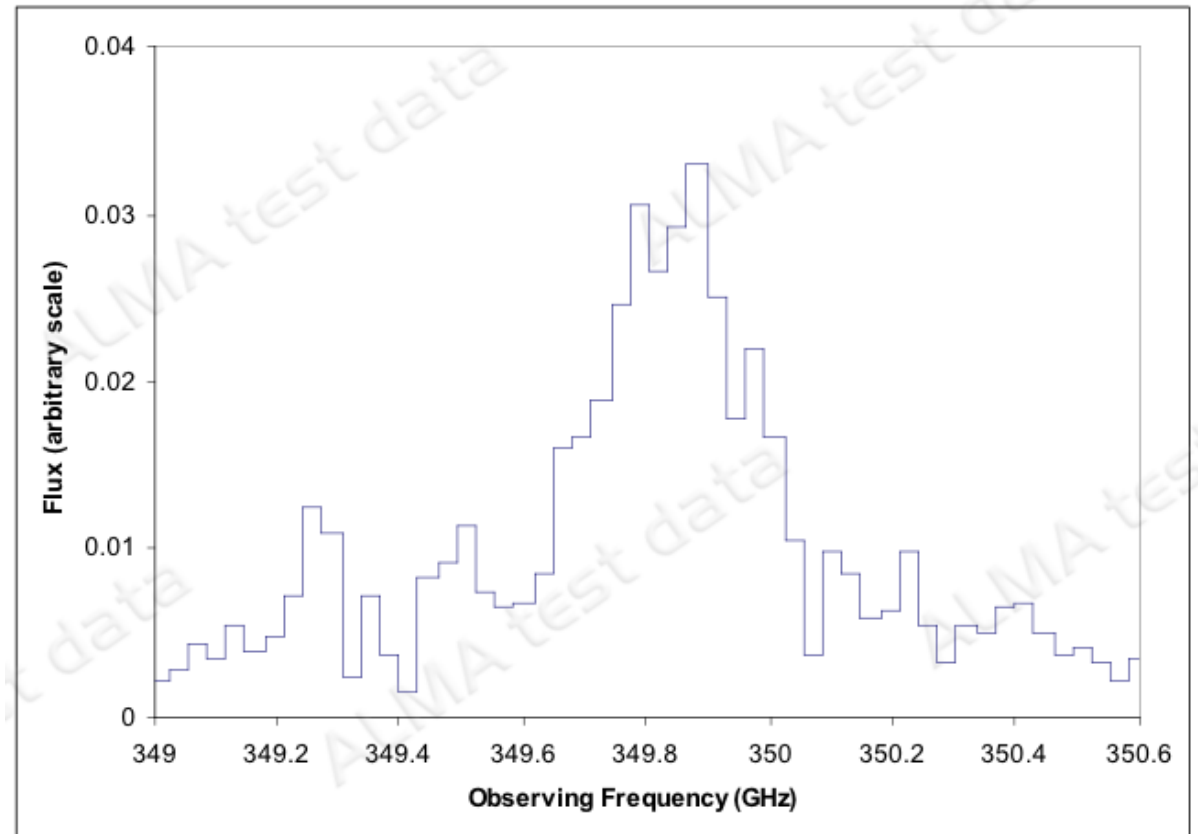
Credit: JAO science team

Pre-science verification observations

Extragalactic, High Redshift Line Sources



C[III] line in BRI 0952 at $z=4.4$



Band 7 16th Nov 2010 ↑
← APEX

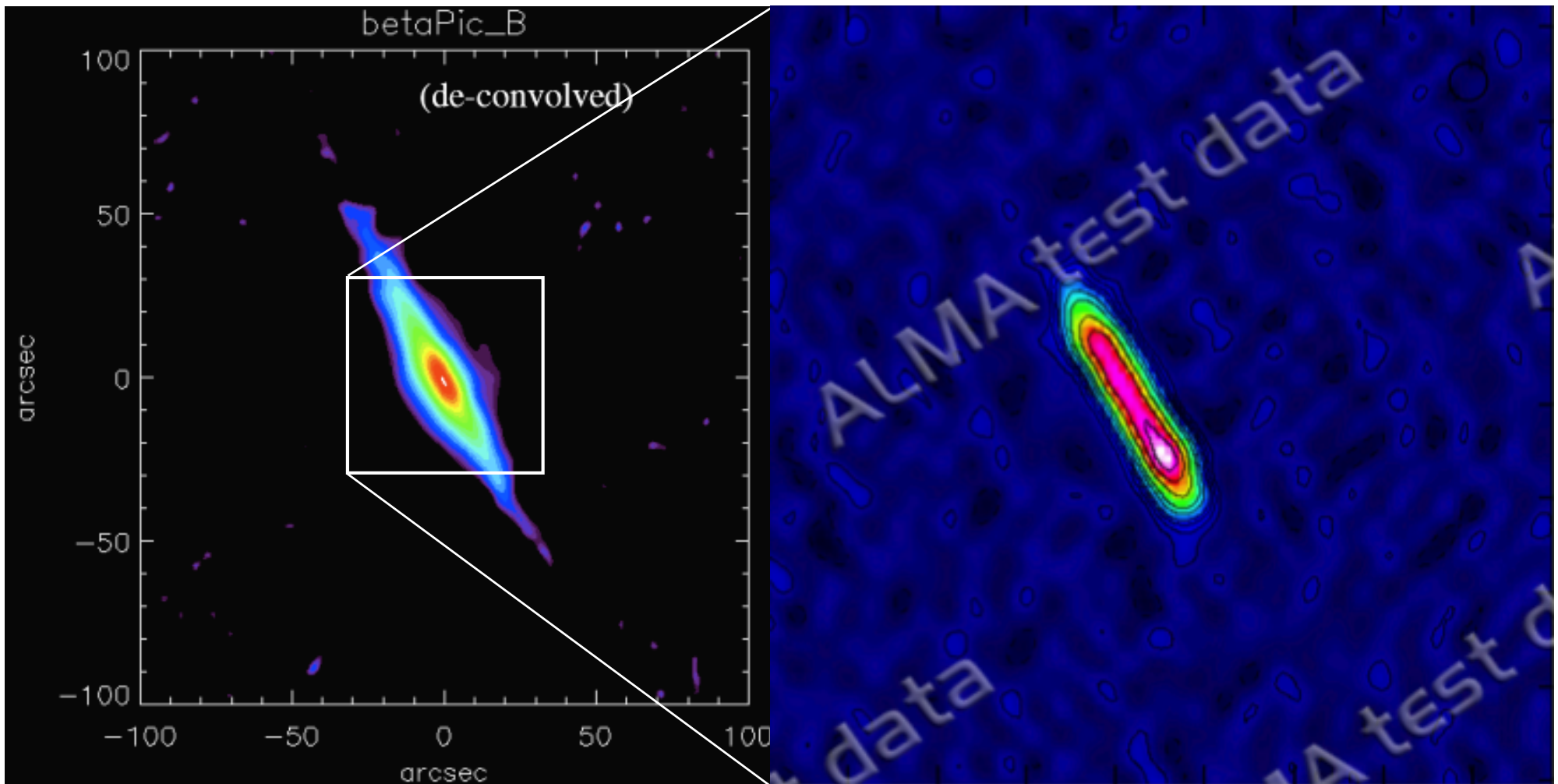
Credit: JAO science team

Pre-science verification observations Galactic, Faint Continuum (Debris Disk)

β Pictoris

Herschel \downarrow 70 microns

ALMA Band 7 \downarrow (11th Nov)



Science verification

- Goals:
 - End to End Test of ALMA as a telescope before Early Science
 - Provide data, images (and enthusiasm) to community
- Call for Suggestions
 - Not full proposals, just a couple of paragraphs
 - No full proposal review process, appropriate projects chosen by committee led by Project Scientist
- Data not proprietary
 - Images released through EPO department
 - Data available to any users who wish to try data reduction

Various types of observations needed

- Discrete sources, continuum and spectral line
- All bands, all correlator setups
- Single and multiple lines - is it easy to create complicated setups in the OT?
- Single and multiple sources per SB – can the system deal with different source redshifts and calibrate correctly?
- Bright and weak lines – weak lines need good bandpass
- Absorption and emission lines
- Narrow and broad lines
- High-resolution, narrow bandwidth correlator modes requiring wider bandwidth on calibrators
- (Mixed correlator modes – Q2 2011)
- (Compact & extended arrays - Q2 2011)

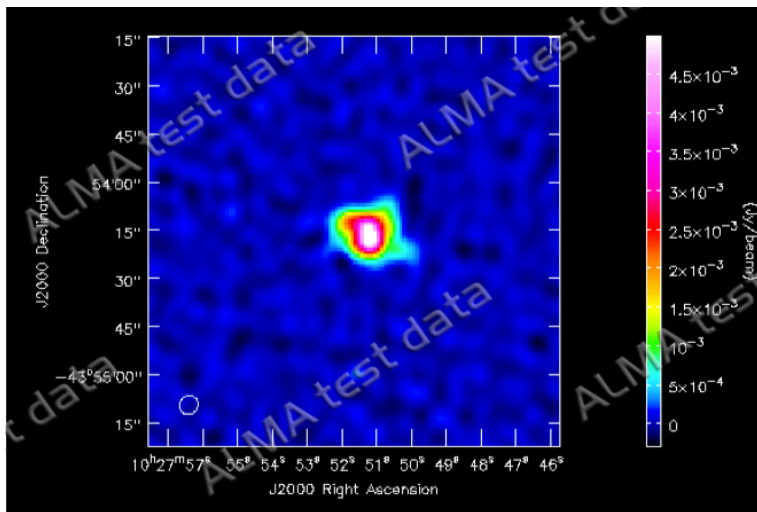
Current list of targets

- NGC3256
- TW Hydrae
- Antennae galaxies (NGC4038/4039)
- HD 107146 (debris disk)
- BRI1202-0725 (CII)
- IRAS16293

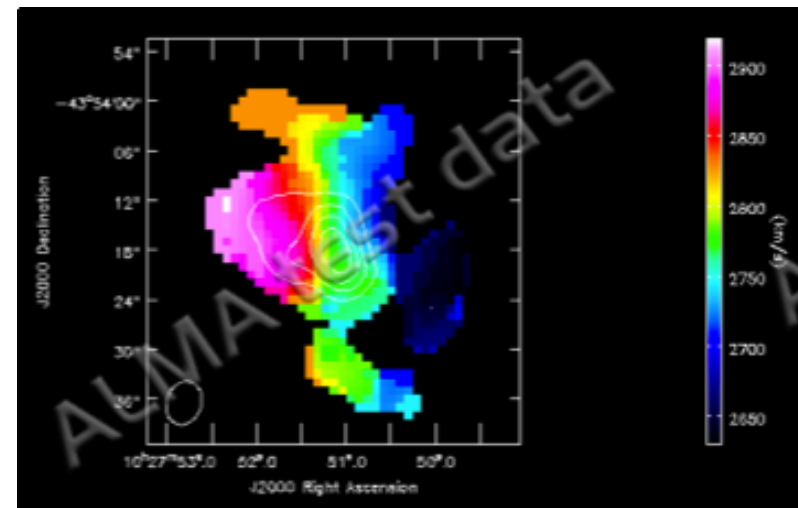
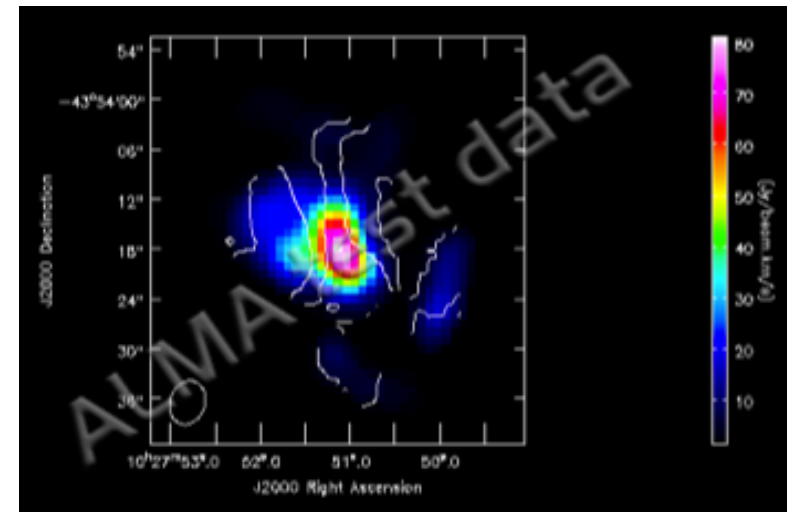
NGC3256

Extragalactic, Large disk of molecular gas
Band 3, continuum + CO (1-0)

Continuum



CO(1-0) map
+ velocity field

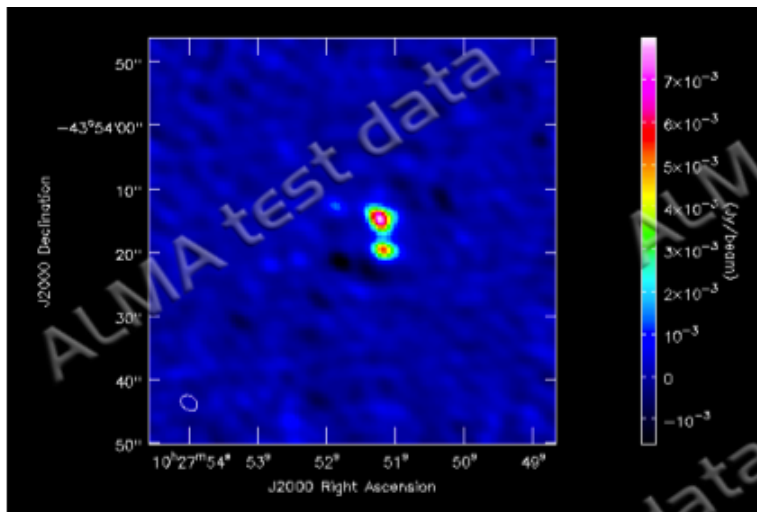


Credit: JAO science team

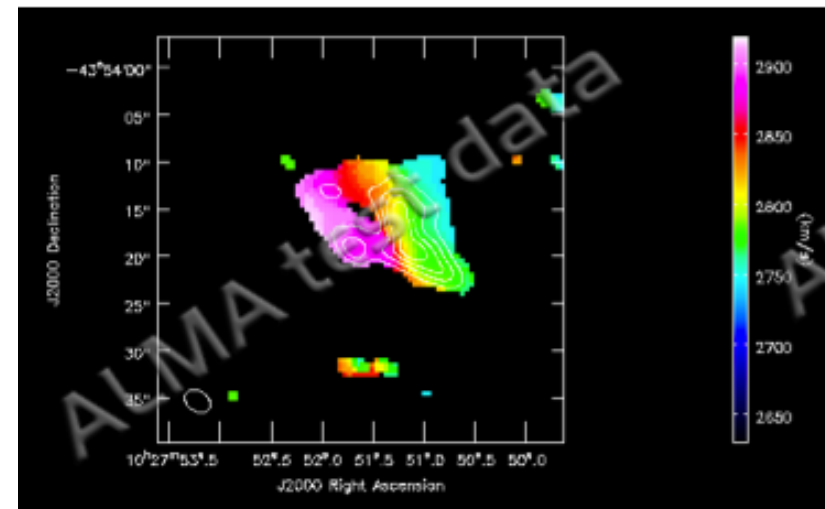
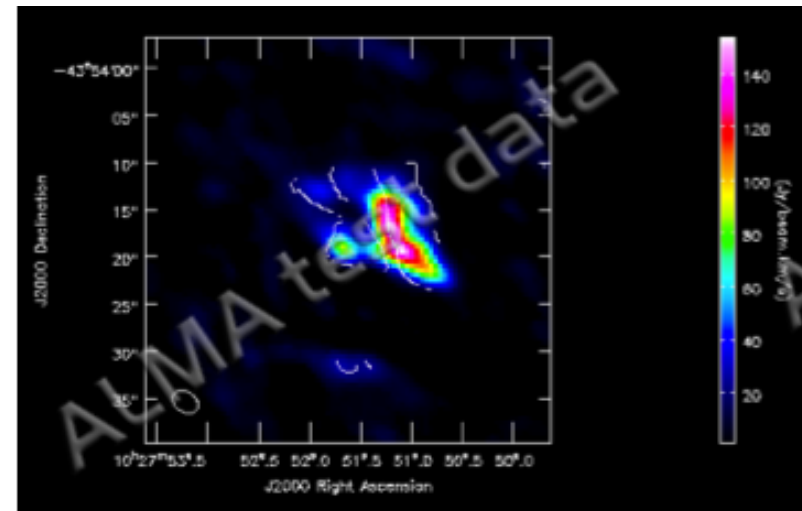
NGC3256

Extragalactic, Large disk of molecular gas
Band 6, continuum + CO (2-1)

Continuum



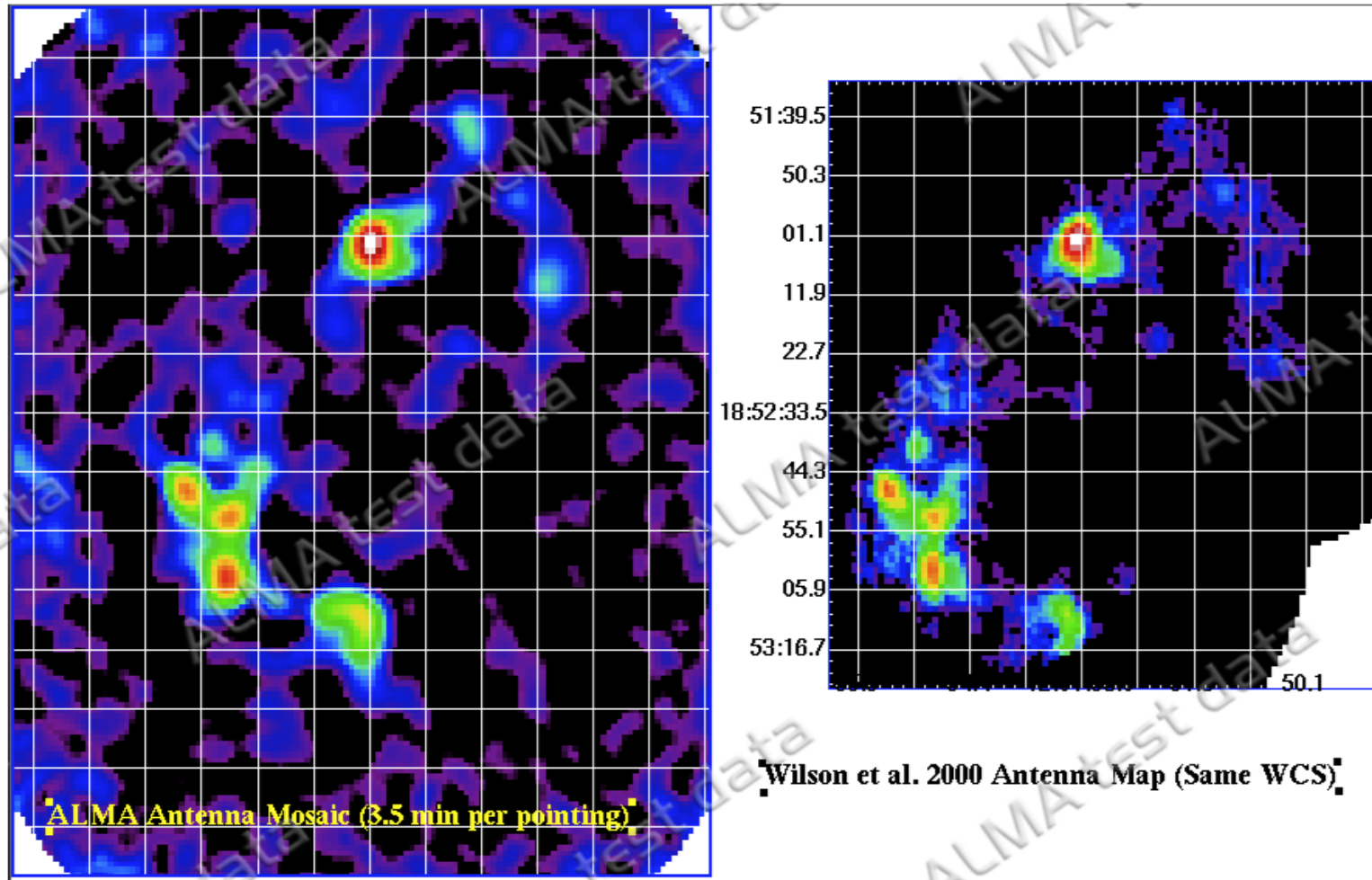
CO(2-1) map
+ velocity field



Credit: JAO science team

The Antennae galaxies (NGC4038/4039)

Extragalactic, star forming region
Band 3, CO (1-0), mosaic of 31 pointings



Credit: JAO science team